

GTVA220701FA

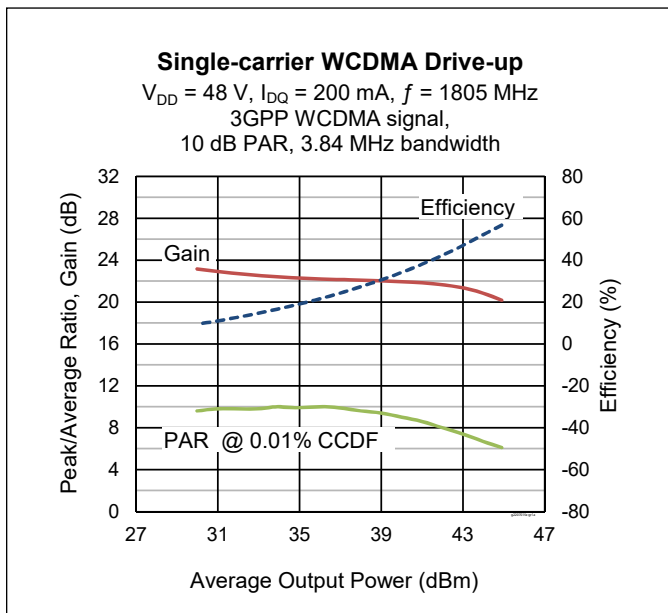
Thermally-Enhanced High Power RF GaN on SiC HEMT
70 W, 50 V, 1805 – 2170 MHz



Package Types: H-37265J-2

Description

The GTVA220701FA is a 70-watt (P_{3dB}) GaN on SiC high electron mobility transistor (HEMT) for use in multi-standard cellular power amplifier applications. It features input matching, high efficiency, and a thermally-enhanced package with earless flange.



Features

- GaN on SiC HEMT technology
- Input matched
- Typical CW performance, 1880 MHz, 48 V
 - Output power at $P_{3dB} = 45\text{ W}$
 - Efficiency = 60.7%
 - Gain = 21.6 dB
- Human Body Model, Class 1A (per ANSI/ESDA/ JEDEC JS-001)
- Capable of handling 10:1 VSWR @48 V, 40 W (CW) output power
- RoHS-compliant

RF Characteristics

Single-carrier LTE Specifications (tested in the test fixture)

$V_{DD} = 48\text{ V}$, $I_{DQ} = 200\text{ mA}$, $P_{OUT} = 6.3\text{ W avg}$, $f = 2170\text{ MHz}$, 3GPP signal, 3.84 channel bandwidth, peak/average = 10.6 dB @ 0.01% CCDF

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Gain	G_{ps}	20.75	22	—	dB
Drain Efficiency	η_D	24.5	27	—	%
Adjacent Channel Power Ratio	ACPR	—	-36.5	-33	dBc
Output PAR at 0.01% probability on CCDF	OPAR	8.0	8.7	—	dB

Note:

All published data at $T_{CASE} = 25^\circ\text{C}$ unless otherwise indicated

ESD: Electrostatic discharge sensitive device—observe handling precautions!



DC Characteristics

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Conditions
Drain-source Breakdown Voltage	$V_{BR(DSS)}$	150	—	—	V	$V_{GS} = -8\text{ V}, I_D = 7.2\text{ mA}$
Drain-source Leakage Current	I_{DSS}	—	—	5	mA	$V_{GS} = -8\text{ V}, V_{DS} = 10\text{ V}$
Gate Threshold Voltage	$V_{GS(th)}$	-3.8	-3.0	-2.3	V	$V_{DS} = 10\text{ V}, I_D = 7.2\text{ mA}$

Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Drain Operating Voltage	V_{DD}	0	—	50	V	$V_{DS} = 48\text{ V}, I_D = 0.2\text{ A}$
Gate Quiescent Voltage	$V_{GS(Q)}$	—	-2.8	—		

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-source Voltage	V_{DSS}	125	V
Gate-source Voltage	V_{GS}	-10 to +2	
Operating Voltage	V_{DD}	55	
Gate Current	I_G	7.2	mA
Drain Current	I_D	2.7	A
Junction Temperature	T_J	225	°C
Storage Temperature Range	T_{STG}	-65 to +150	

Operation above the maximum values listed here may cause permanent damage. Maximum ratings are absolute ratings; exceeding only one of these values may cause irreversible damage to the component. Exposure to absolute maximum rating conditions for extended periods may affect device reliability. For reliable continuous operation, the device should be operated within the operating voltage range (V_{DD}) specified above.

Thermal Characteristics

Characteristics	Symbol	Value	Unit	Conditions
Thermal Resistance	$R_{\theta JC}$	2.36	°C/W	$T_{CASE} = 70\text{ °C}, 55\text{ W (CW)}, V_{DD} = 48\text{ V}, 2170\text{ MHz}$

Ordering Information

Type and Version	Order Code	Package Description	Shipping
GTVA220701FA V1 R0	GTVA220701FA-V1-R0	H-37265J-2, earless flange	Tape & Reel, 50 pcs
GTVA220701FA V1 R2	GTVA220701FA-V1-R2	H-37265J-2, earless flange	Tape & Reel, 250 pcs

Typical Performance (data taken in an the production test fixture)

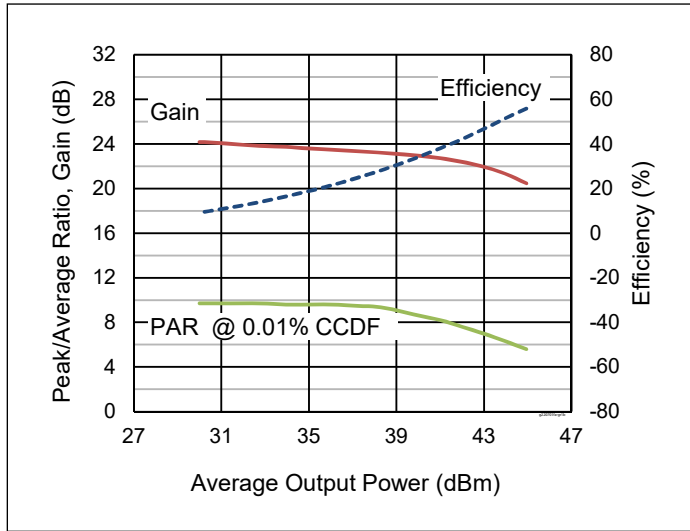


Figure 1. Single-carrier WCDMA Drive-up

$V_{DD} = 48\text{ V}$, $I_{DQ} = 200\text{ mA}$, $f = 1880\text{ MHz}$
 3GPP WCDMA signal,
 10 dB PAR, 3.84 MHz bandwidth

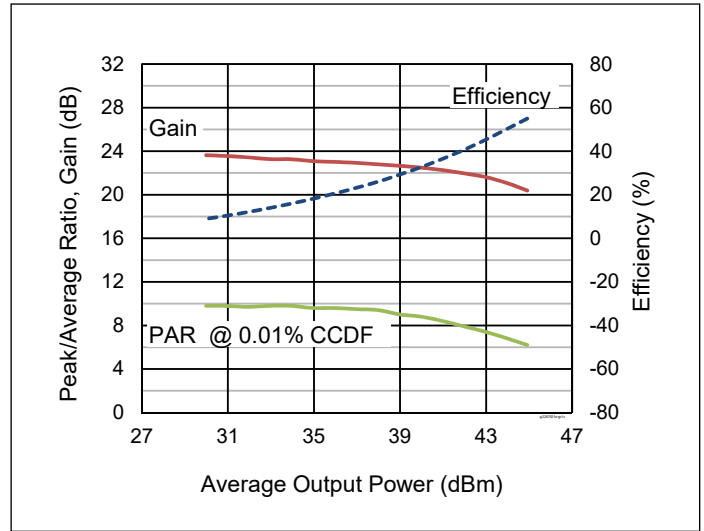


Figure 2. Single-carrier WCDMA Drive-up

$V_{DD} = 48\text{ V}$, $I_{DQ} = 200\text{ mA}$, $f = 2170\text{ MHz}$
 3GPP WCDMA signal,
 10 dB PAR, 3.84 MHz bandwidth

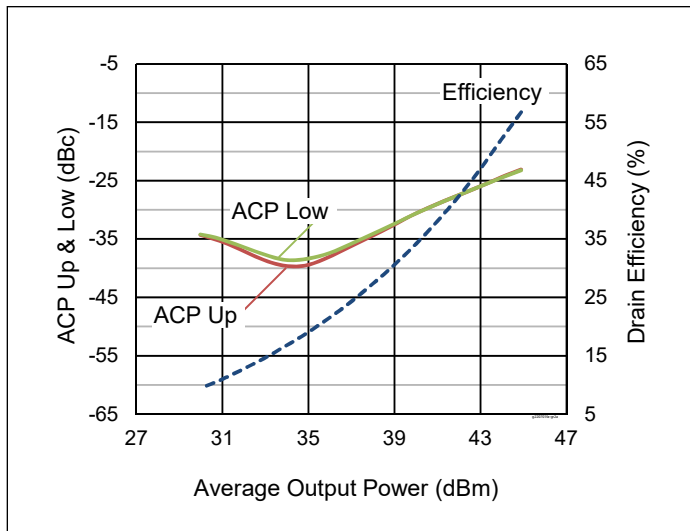


Figure 3. Single-carrier WCDMA Drive-up

$V_{DD} = 48\text{ V}$, $I_{DQ} = 200\text{ mA}$, $f = 1805\text{ MHz}$,
 3GPP WCDMA signal, 10 dB PAR,
 3.84 MHz bandwidth

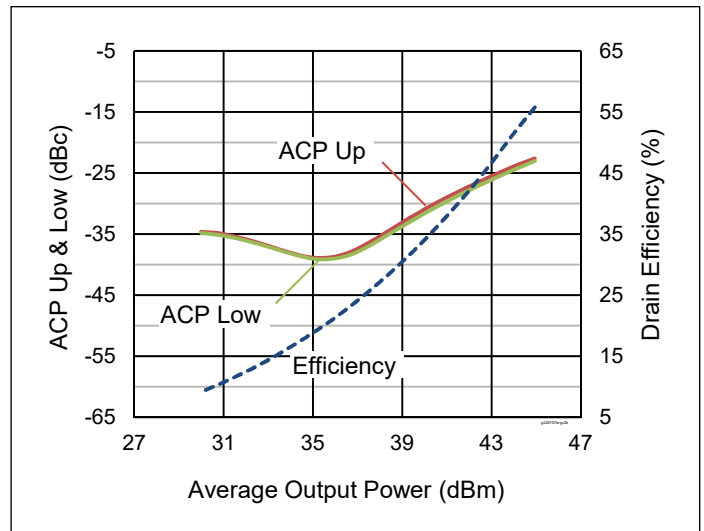


Figure 4. Single-carrier WCDMA Drive-up

$V_{DD} = 48\text{ V}$, $I_{DQ} = 200\text{ mA}$, $f = 1880\text{ MHz}$,
 3GPP WCDMA signal, 10 dB PAR,
 3.84 MHz bandwidth

Typical Performance (cont.)

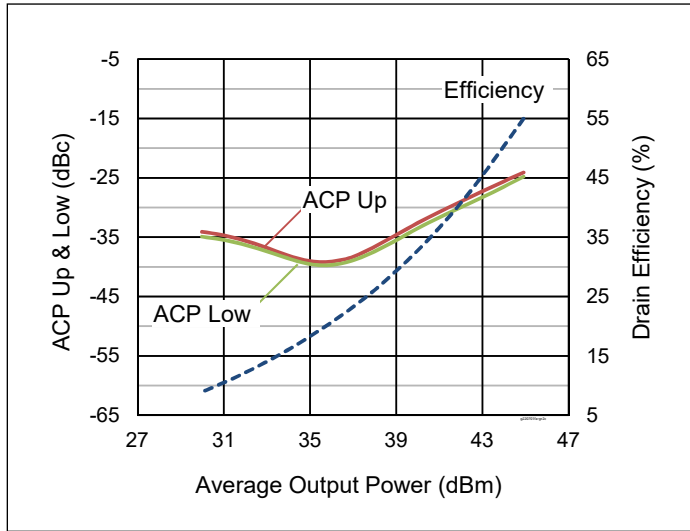


Figure 5. Single-carrier WCDMA Drive-up

$V_{DD} = 48\text{ V}$, $I_{DQ} = 200\text{ mA}$, $f = 2170\text{ MHz}$,
3GPP WCDMA signal, 10 dB PAR,
3.84 MHz bandwidth

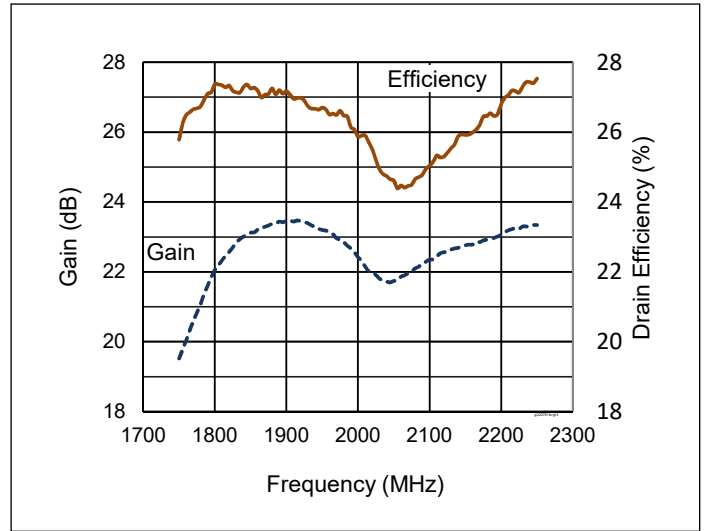


Figure 6. Single-carrier WCDMA Broadband Performance

$V_{DD} = 48\text{ V}$, $I_{DQ} = 200\text{ mA}$, $P_{OUT} = 38.0\text{ dBm}$,
3GPP WCDMA signal, 10 dB PAR

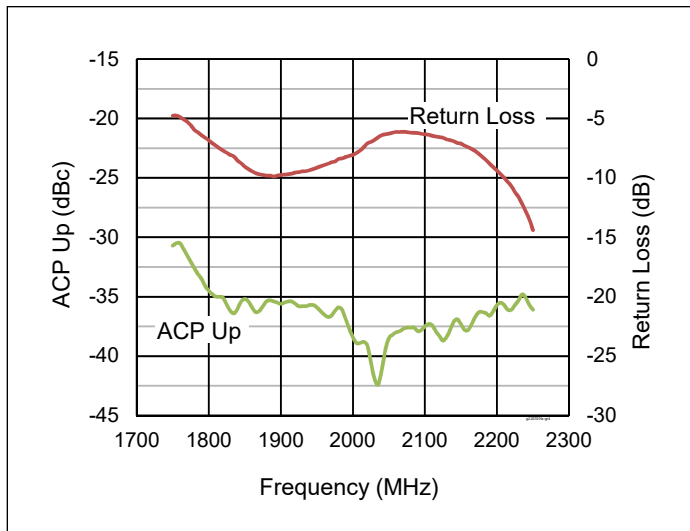


Figure 7. Single-carrier WCDMA Broadband Performance

$V_{DD} = 48\text{ V}$, $I_{DQ} = 200\text{ mA}$, $P_{OUT} = 38.0\text{ dBm}$,
3GPP WCDMA signal, 10 dB PAR

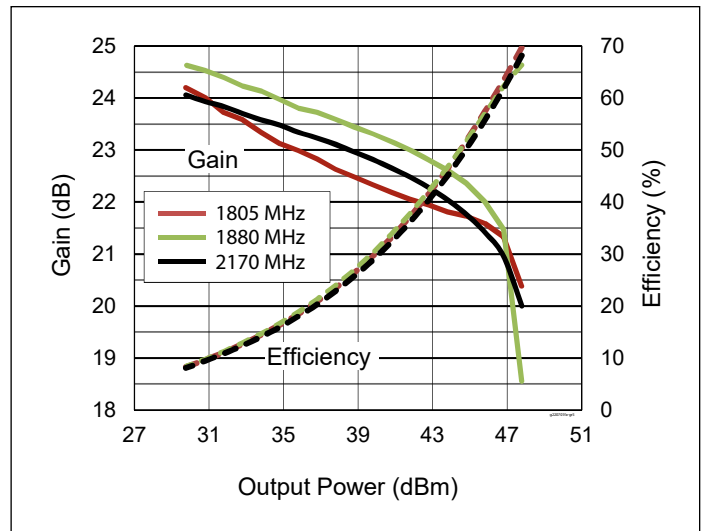


Figure 8. CW Performance

(series show frequency)
 $V_{DD} = 48\text{ V}$, $I_{DQ} = 200\text{ mA}$

Typical Performance (cont.)

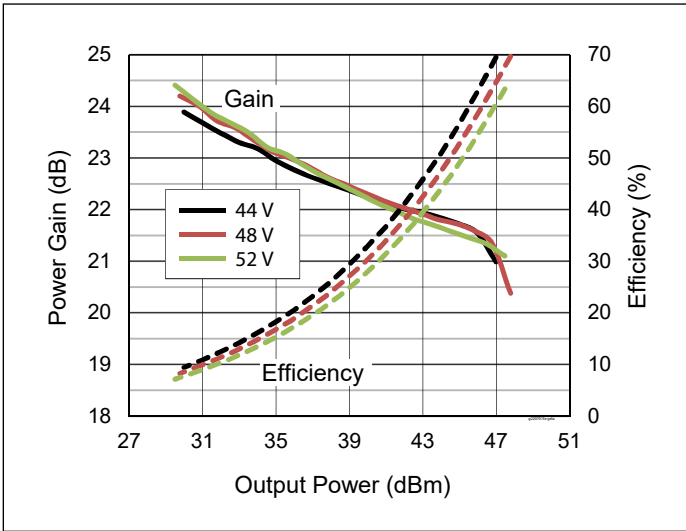


Figure 9. CW Performance at Selected Supply Voltage

$I_{DQ} = 200 \text{ mA}$, $f = 1805 \text{ MHz}$

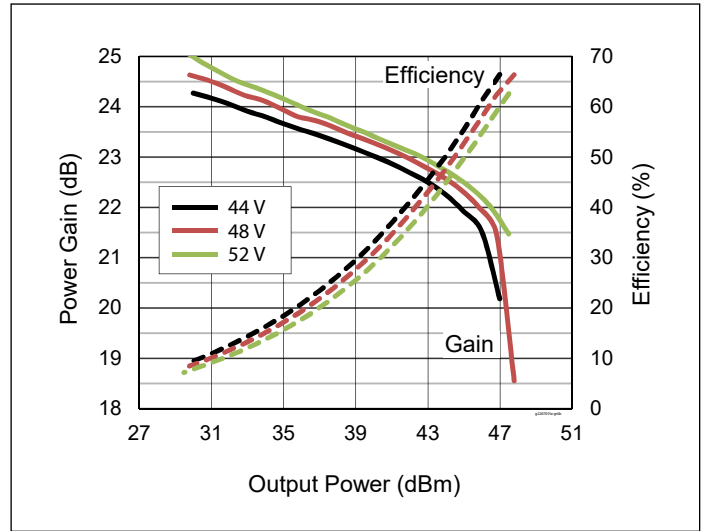


Figure 10. CW Performance at Selected Supply Voltage

$I_{DQ} = 200 \text{ mA}$, $f = 1880 \text{ MHz}$

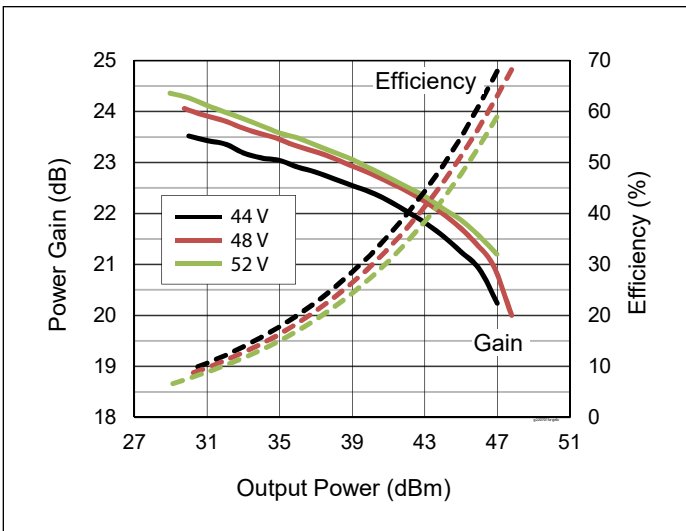


Figure 11. CW Performance at Selected Supply Voltage

$I_{DQ} = 200 \text{ mA}$, $f = 2170 \text{ MHz}$

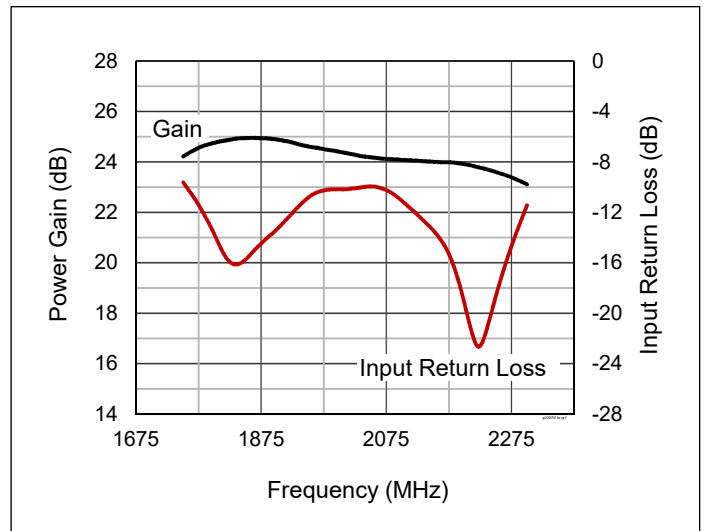
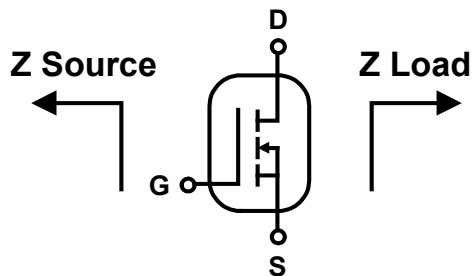


Figure 12. Small Signal CW Gain & Input Return Loss

$V_{DD} = 48 \text{ V}$, $I_{DQ} = 200 \text{ mA}$

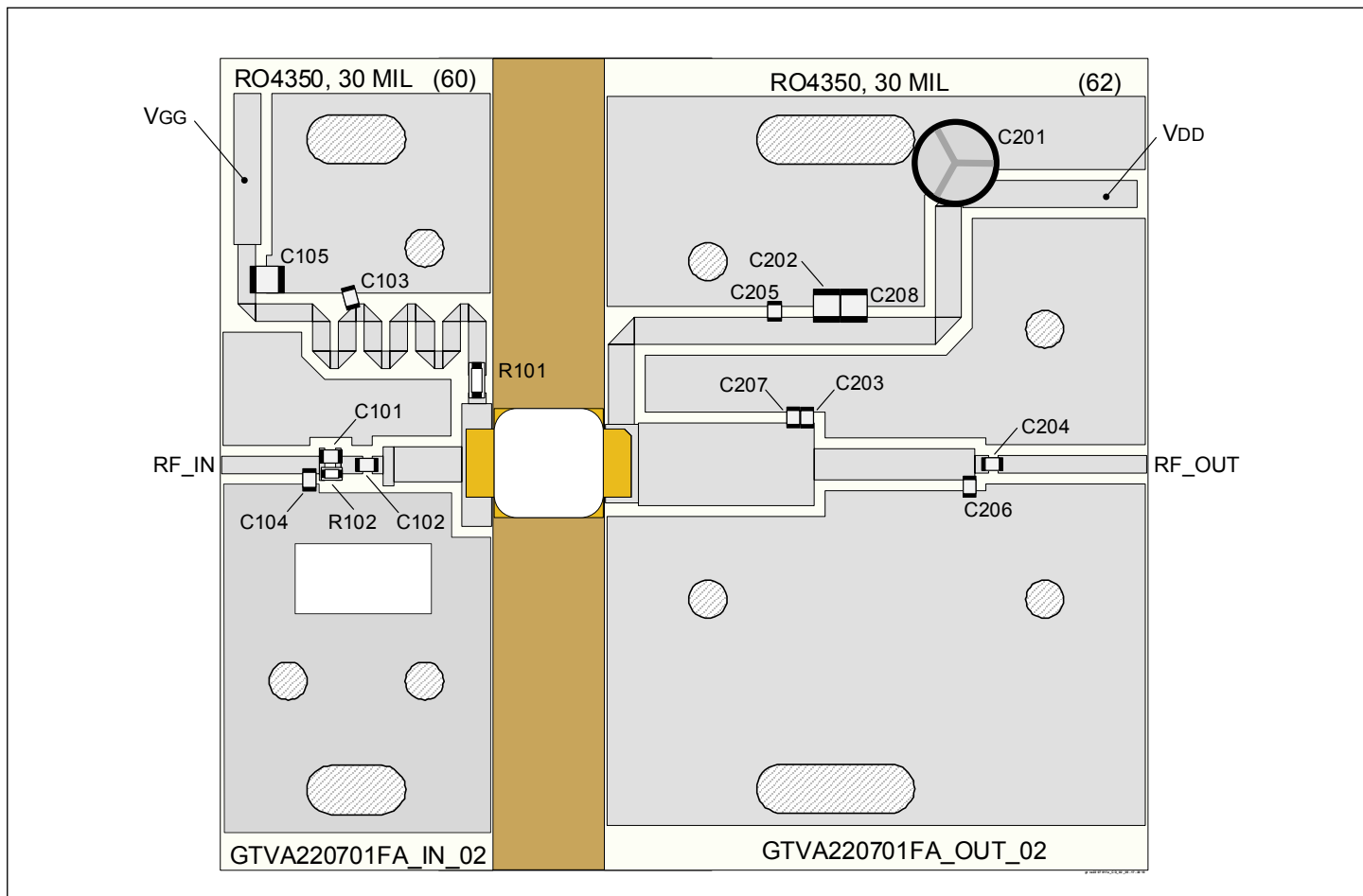
Broadband Circuit Impedance (combined leads)



Freq [MHz]	Z Source Ω		Z Load Ω	
	R	jX	R	jX
1805	1.95	-5.67	12.02	5.87
1840	2.01	-6.27	11.94	3.94
1880	2.43	-7.17	11.33	3.15
2100	9.95	-9.38	10.39	0.02
2140	11.40	-8.40	10.31	-0.75
2170	11.61	-9.07	10.50	-2.23

Evaluation Board, 1805 MHz to 2170 MHz

Evaluation Board Part Number	LTN/GTVA220701FA-V1
PCB Information	Rogers 4350, 0.762 mm [.030"] thick, 2 oz. copper, $\epsilon_r = 3.66$



Reference circuit assembly diagram (not to scale)

Components Information

Component	Description	Manufacturer	P/N
Input			
C101	Capacitor, 2.4 pF	ATC	ATC600F2R4JT250XT
C102, C103	Capacitor, 20 pF	ATC	ATC600F200JT250XT
C104	Capacitor, 1 pF	ATC	ATC600F1R0JT250XT
C105	Capacitor, 10 μ F	Taiyo Yuden	UMK325C7106MM-T
R101	Resistor, 10 ohms	Panasonic Electronic Components	ERJ-8GEYJ100V
R102	Resistor, 330 ohms	Panasonic Electronic Components	ERJ-3GEYJ331V
Output			
C201	Capacitor, 47 μ F	Cornell Dubilier Electronics (CDE)	SEK470M100ST
C202, C208	Capacitor, 10 μ F	Taiyo Yuden	UMK325C7106MM-T
C203	Capacitor, 1 pF	ATC	ATC600F1R0JT250XT
C204, C205	Capacitor, 20 pF	ATC	ATC600F200JT250XT
C206	Capacitor, 0.7 pF	ATC	ATC600F0R7JT250XT
C207	Capacitor, 0.3 pF	ATC	ATC600F0R3JT250XT

Bias Sequencing

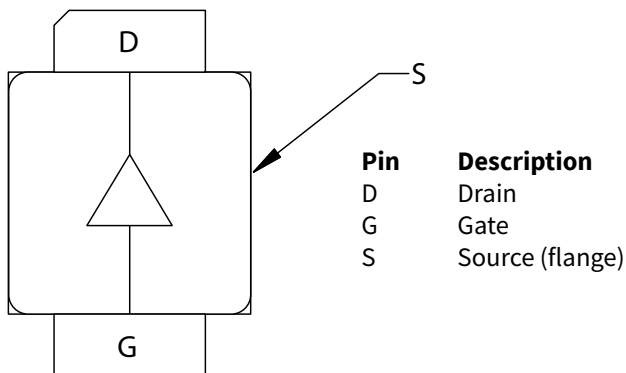
Bias On

1. Ensure RF is turned off
2. Apply pinch-off voltage of -5 V to the gate
3. Apply nominal drain voltage
4. Bias gate to desired quiescent drain current
5. Apply RF

Bias Off

1. Turn RF off
2. Apply pinch-off voltage to the gate
3. Turn-off drain voltage
4. Turn-off gate voltage

Pinout Diagram (top view)



Package Outline Specifications – Package H-37265J-2

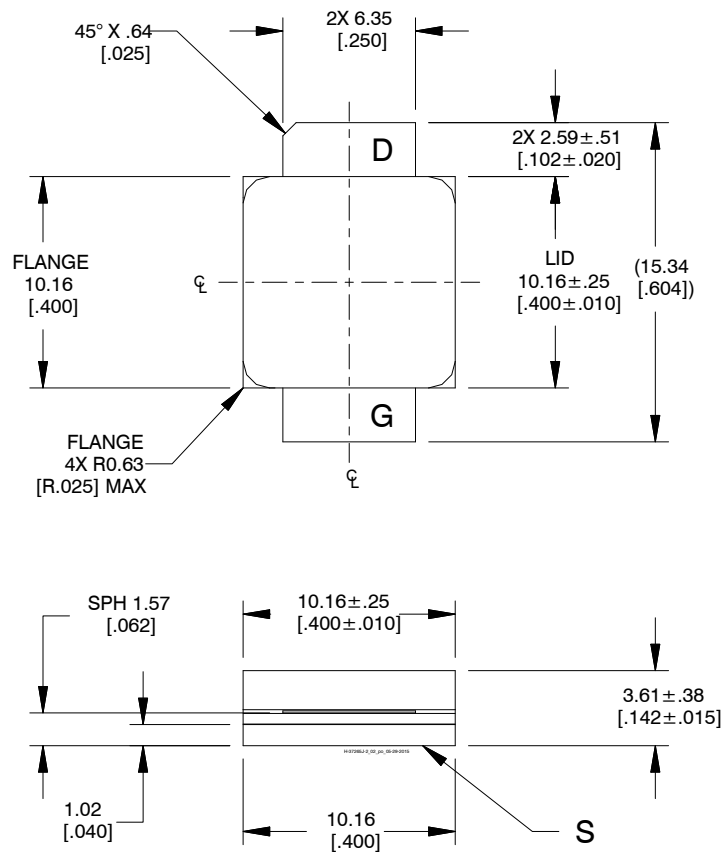


Diagram Notes—unless otherwise specified:

1. Interpret dimensions and tolerances per ASME Y14.5M-1994.
2. Primary dimensions are mm. Alternate dimensions are inches.
3. All tolerances ± 0.127 [$.005$] unless specified otherwise.
4. Pins: D – drain; G – gate; S – source.
5. Lead thickness: $0.10 + 0.051/-0.025$ mm [$.004 + 0.002/-0.001$ inch].
6. Gold plating thickness: 1.14 ± 0.38 micron [45 ± 15 microinch].

Notes & Disclaimer

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